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Central Bank Losses

Origins, Conceptual Issues, and Measurement Problems

Mario O. Teijeiro

Central bank losses usually originate when the bank takes on such nontraditional bank functions as subsidized loans to priority sectors, rescues of troubled financial institutions, or takeovers of private or public debt. There is a way to overcome problems measuring these losses.

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Under normal conditions, central banks will be profitable, since they have access to zero-cost financing (the monetary base) and probably some financing at below-market interest rates — and are able to invest these funds at market rates.

In his analysis of central bank losses, Teijeiro assumes that these sources of cheap financing have been exhausted, so that at the margin any asset yielding below market rates will produce a loss.

Central bank losses usually originate, he says, when the bank takes on other functions besides its normal role, such as subsidized loans to priority sectors, rescues of troubled financial institutions, or takeovers of private or public debt.

The losses are difficult to measure, however, because of inconsistencies between central bank and nonfinancial public sector accounting.

Measurements that cause difficulty involve, for example, the central bank treatment of nominal capital gains on foreign exchange dealings, accounting for loans, and adjusting operating results for the effect of inflation.

Teijeiro recommends a method for dealing with these problems. In many cases, he admits, data problems may necessitate the shortcut of calculating the central bank deficit from changes in its assets and liabilities.

This paper is a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Raquel Luz, room N11-057, extension 61588 (23 pages).

Central Bank Losses
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by
Mario O. Teijeiro

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This paper attempts to make a condensed but still comprehensive review of the issues related to Central Bank's quasi-fiscal deficits. In the first section a taxonomic description of origins of quasi-fiscal deficits is made. In the second section, the relation between economic and accounting losses is explored; potential problems of consolidation with the non-financial public sector are highlighted; in the third section issues like adjustment for inflation and net lending treatment, which are also relevant to the definition of non financial public sector deficits, are considered. In the last section, alternative ways of calculating the Central Bank's quasi fiscal losses are suggested.

I. Most important sources of Central Bank's quasi fiscal deficits

Under normal conditions Central Banks will be profitable, the reason being that they have access to zero cost financing (namely, the monetary base) and probably some financing at below market interest costs (for example, below market remunerated commercial bank's deposits); while being able to invest these funds at market rates. Moreover profits may originate in financial investments funded with its own liquid net worth. In what follows it will be assumed that these sources of cheap financing have been exhausted and therefore on the margin any asset yielding below market rates will originate a loss. While describing sources of Central Bank's losses, a distinction is made between cash flow losses and accrued capital gains/losses.

Sources of cash-flow losses

The most common source of Central Bank losses is lending to the non-financial public sector at no or very low interest. In many countries lending to the central government is done at a very low nominal rate by law. These loans may be taken to finance regular (above the line) operations or they may originate in central bank's assumptions of government domestic or foreign

debt. Argentina is a case of legislated forced lending to the government at very low nominal interest; it was originally intended to pass on to the central government the benefits of the zero cost financing through money base issuance; but lending to the government has many times exceeded the monetary base, originating therefore not only a marginal but a total loss to the Central Bank. In other cases, for example Mexico, the interest the government pays to the Central Bank is determined ex-post, once the actual average cost of Central Bank funding is known[1] ; in this case the benefits of cheap financing will be fully passed to the government but the Central Bank will incur no losses. Both methodologies deviate from the guidelines provided by the IMF Manual of Government Statistics which recommends charging the government a market rate for the entire debt and later transferring the Central Bank's profits to the government. This recommendation would in principle not change the central government deficit as resulting from the Mexican approach but would improve the account classification: Central Government interest service would fully reflect market rates and Central Bank's profits would be accounted as non-tax revenue.[2]

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1. Lending to the government is assumed to be financed first by the (non-interest bearing) monetary base, and the excess that cannot be funded in this way, is assumed to be funded by remunerated reserve requirements. Therefore the government is charged with a market rate at the margin.

2. However, the results arising from these apparently equivalent approaches would not be identical for several reasons: a) Central Bank's profits could be distributed with a lag of one calendar period; b) Central Bank's statutes may prevent a 100% distribution of profits; c) in some circumstances not all 100% of profits may belong to the central government.

Another major source of losses is subsidized lending; the Central Bank is regularly involved in funding special lines to priority sectors like housing, agriculture, strategic industries, non-traditional exports, etc. In some cases these lines can be made available through the commercial banking system; in other cases however the Central Bank may be directly involved in development lending.

Rescue of troubled financial institutions is another source of cash flow losses either because: a) the troubled institution is granted a rediscount at subsidized rates or b) the Central Bank takes over "bad" (non-interest accruing) assets.

Holding of both foreign assets and liabilities may also result in cash flow losses if the return on assets is lower than the interest cost on liabilities. There are also circumstances in which a (positive) net foreign asset position is marginally financed through interest bearing domestic liabilities, producing a loss if foreign interest rates are lower than domestic ones.[3]

The practice of multiple exchange rates opens the possibility of exchange rate losses (as well as gains). Economic (cash flow) losses in exchange intermediation arises whenever foreign exchange is sold (bought) at prices below (above) the market price.

Finally, the accumulation of past losses (either of a cash flow or of a capital nature) may eventually move the Central Bank balance sheet to a position of negative liquid net worth. The interest bearing financing of such position is frequently another source of cash flow losses.

3.We are ignoring for the time being the existence of foreign and domestic inflation, implicitly comparing <u>real</u> (domestic and foreign) interest rates.

Sources of capital gains/losses

Capital gains/losses are common in Central Bank's activity; among the more frequent ones are the following:

Central Bank assumption of private or public debt usually involves an immediate capital loss; that happens for example when an artificial exchange rate is used to assume foreign debt. Arrangements to rescue troubled financial institutions may involve that the Central Bank buys bad assets as if they were good ones. Regular (subsidized or not) rediscount facilities or development lending may be uncollectable from the very beginning or they may become uncollectable over time.

When the Central Bank intervenes in forward exchange markets, granting for example exchange guarantees, capital losses may result. Holdings of foreign assets and liabilities may be denominated in more than one currency; if so, fluctuation of foreign exchange parities may produce capital losses. Finally, capital gains and losses may result from changes in the real exchange rate in the presence of a net foreign asset position (reserves minus foreign liabilities).

II. Deviations of accounting from economic losses

This section reviews treatments that explain differences between economic and accounting results of Central Banks. In doing so, it is assumed that the desirable benchmark is one in which the income/loss statement reflects all true cash-flow results of the Central Bank, while accrued capital gains and losses are fully reflected in a reserve (net worth) account. This convention would allow consolidation of public sector results, since non-financial public sector deficit accounting is done on a cash basis.

Problems derived from inconsistent accounting

In theory, full consistency between Central Bank and non financial public sector accounting should be expected since all transactions between them should be accounted with similar criteria. However, major discrepancies may exist. In some cases, Central Governments delay payment of accrued interest to the Central Bank, therefore reducing its cash domestic interest service; Central Banks may at the same time compute that interest as income on an accrual basis, debiting a special central government account that is not properly consolidated. Another potential source of inconsistency is the use of different exchange rates; while the central government may use a special exchange rate to make foreign payments, the Central Bank may compute the corresponding exchange sale at market prices; again a non-consolidated lending to the central government will explain the difference.[4] Another source of consolidation problems is the distribution of Central Bank profits; Central Governments usually record Central Bank dividends as (genuine) non-tax revenue, while Central Banks do not record them as an expense but as a profit distribution item.

Accounting of exchange rate intervention

The accounting of exchange rate losses is one major source of discrepancy between economic and accounting results. Assuming that in a market of multiple exchange rates we can define which is "the" market rate, there are two basic approaches to follow in a non inflationary context.[5]

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4. Improper consolidation is facilitated when the financial relations between the Central Bank and the Central Government are channeled through multiple accounts.

5. When a regime of multiple exchange rates exists, there will always be a degree of arbitrariness in defining "the" market rate. But what is of the essence is that all transaction results be accounted with reference to a single rate.

One approach would revalue every day the stock of reserves (and liabilities), using the daily market rate; the revaluation would be credited to a reserve account. The exchange losses that would affect the income and loss statement would be calculated by the product between the amount of foreign exchange sold (bought) times the difference between the daily rate and the average price of the exchange sold (bought).

An alternative approach would not make any daily revaluation of the stock of foreign exchange. Instead it may recalculate on a daily basis what is the historical or accounting cost of the marginal unit of foreign exchange the Central Bank would sell; for that, different criteria would be used (FIFO, LIFO, average price). The Central Bank would generate profits (losses) only when it sells foreign exchange. And the profit will be determined as the difference between the actual average price of the foreign exchange sold and the historical cost imputed to it.

The first approach accounts capital gains/losses on an accrual basis, but they are not incorporated in the income/loss statement; rather they are part of the net worth position in a special account; only pure intermediation (flow) results in foreign exchange dealings would enter in the income/loss statement. The second approach instead, never computes capital gains or losses on an accrual basis. Capital gains or losses however determine the income statement as they are "realized" (foreign exchange held in inventory at a historical cost of acquisition is sold at current prices). The "realization" of capital gains (arbitrarily) depends upon the cost criteria utilized. The "realization" is larger if FIFO is used and it is the smallest if LIFO is used.

The second approach is most used. It follows the accounting principle that, while capital gains or losses are part of true income,

prudence advises to reflect them only as they are realized. The meaning of the exchange results derived from the application of this approach can therefore be completely obscure and unrelated to the true economic cash-flow result. The problems of this accounting approach are seriously compounded in an inflationary context, since "nominal" capital gains are potentially much more important than real capital gains. It is even possible that the Central Bank can "profit" (in an accounting sense) while selling foreign exchange at a highly subsidized rate, provided inflation was important enough since the moment the unit of currency sold, was bought.

Accounting of interest on bad assets

When the Central Bank holds bad assets, many outcomes are possible. Most likely bad loans will continue to be treated as good ones, recording as income accrued interest that is not received but is capitalized. In this case Central Bank profits (losses) will be overestimated (underestimated). Another approach would be not to accrue interest at all, which would be coherent with the economic cash flow if bad assets were truly uncollectable.

A special case arises when a private financial institution is in trouble. The troubled entity may initially use general rediscount facilities, allowing the central bank to record as income high interest charges and penalties. When a legal agreement is reached to reorganize the financial institution, past exceptional charges and penalties may be waived retrospectively producing a once and for all downward adjustment in the income/loss statement.

Accounting of capital gains/losses

It was argued at the beginning of this section that, for purposes of more meaningful consolidation with the non financial public sector deficit, the Central Bank's income/loss statement should only reflect true economic cash results. Income/loss statements usually deviate from this benchmark when

capital gains or losses enter into its determination. Traditional accounting of foreign exchange dealings was mentioned as a case in which (even nominal) "realized" capital gains or losses may affect income/loss statements. Another relevant case appears when Central Bank lending to the private sector is written off or contingent reserves built against current results.

Impact of inflation on income/loss statements

Inflation is another major source of discrepancy between economic and accounting results. Accounting conventions would include in income/loss statements all flow receipts and payments, but will not include nominal revaluation of assets and liabilities. For example, a domestic liability whose interest service rise with inflation will increase accounting losses by the full extent of its nominal interest service while a foreign liability would increase accounting losses only by the extent of the foreign exchange interest service; the devaluation impact on the principal, which is conceptually similar to the inflationary component of a domestic interest service, will be excluded. A symmetrical argument applies to foreign assets vis-a-vis domestic ones. Finally, a similar argument is applicable when a domestic financial asset (liability) is balanced with liquid net worth (negative net worth, usually "other assets net"). While domestic assets increase accounting income by the full extent of the nominal interest, the liquid net worth that backs those assets does not originate any accounting cost. Accounting profits (losses) therefore include the inflationary component of interest income.(payments)

Other issues

To bring full consistency between accounting of Central Bank losses and non-financial public sector deficits, it must be taken into account that public sector deficits are intended to measure financing needs rather than economic results. Consequently, investment expenditure is considered as

deficit spending while amortization of fixed assets is excluded. Central Bank's income/loss statements, to the contrary, include amortization of fixed assets and exclude new gross investments. Moreover, development lending is considered as deficit determining when it is done by the non-financial public sector; Central Bank accounts however would treat such lending initially as an asset rather than as an expense; write offs may follow later.

III. Summary of issues

After this taxonomic review, it is possible to make a more conceptual classification of sources of problems in Central Banks' income/loss accounting. Corrections to traditional accounting may be necessary because of:

a) Problems originating in improper consolidation or asymmetrical treatment of transactions between the Central Bank and the non financial public sector.

b) Different nature of fiscal deficit measures and income/loss statements; while the first aims at obtaining a measure of financing needs, the second one is supposed to be a measure of income. This difference shows up particularly in the treatment of capital gains and (net) development lending to the private sector.

c) Distortions introduced by inflation.

A more conceptual discussion of some of these issues follows. The underlying position of this paper is that meaningful consolidation of deficits requires full consistency of treatment; that such consistency should be achieved adjusting the Central Bank's results for what is necessary to become a measure of financing needs; and finally, that distortions originating in inflation should be dealt with.

The treatment of capital gains

Should an accrued capital loss (for example originating in an exchange rate guarantee not mature yet) be treated as a loss of the Central Bank? If we stick to the idea that the deficit should be a measure of financing needs, then the answer is no. Should the same capital loss be treated as a deficit determining expenditure when it is realized (the contract matures and an exchange differential has to be paid). The answer now seems to be yes, as a financing need is created, but a strong case can be made to exclude even this realized loss. The proper analogy is the treatment of amortization payments in the non-financial public sector; not all financing needs are part of the deficit: amortization payments are excluded even when they have to be financed; the reason for their exclusion is that bondholders are expected to reinvest those funds in the capital market and therefore amortization payments are not supposed to create a new pressure on capital markets (and interest rates). So the generation of a financing need is a necessary condition for an expense to be considered as deficit determining but it is not sufficient; a presumption that the expense will not be reinvested in capital markets but rather spent is also required. Amortization payments are always assumed to be reinvested, even when they involve a capital loss/gain; for example, a large (real) devaluation may originate a capital loss when the government owes foreign debt; such capital loss is realized when the debt is amortized; however, no part of the amortization service is computed above the line as a capital loss. It is not clear whether this treatment is correct or not; most likely, what is more appropriate would depend on cases and circumstances; what is argued however is that if realized capital losses are not deficit determining for the non financial public sector, they cannot be treated as deficit determining when the Central Bank is involved.

This argument supports the idea that adjustment of Central Banks' income/loss statements should aim at eliminating all items that involve capital gains or losses. There are circumstances however in which capital gains and losses may be quite important and relevant for private behavior, in which case an analysis of the evolution of the inflation adjusted financial net worth of the entire public sector may become a necessary complement.

The treatment of net lending

Much controversy still exists regarding proper treatment of development lending to the private sector. The argument in favor of including it as a deficit determining expenditure is due to the fact that it has to be financed. As we argued before, this condition is necessary but not sufficient; it can also be argued that net or development lending satisfies part of the private sector demand for credit that otherwise would have put pressure on capital markets. This argument is yet not conclusive, since it will not hold when development lending finances spending that would not have been made without government financing. This is likely to be the case when development lending is highly subsidized and it is tied to a particular investment. The more subsidized and the more project specific, the stronger the case for including (net) development lending above the line.

The nature of development lending can differ significantly across countries and circumstances; there is therefore no single answer to the net lending controversy. Moreover there are some practical problems related to this issue. Development lending may also be channeled through other public financial institutions whose results may not be consolidated with the non-financial public sector and the Central Bank; shuffling around net lending will jeopardize any meaningful interpretation of the evolution of fiscal deficits over time. Another source of problems for deficit interpretation arises when the public sector influences private decisions not only through

lending and borrowing, but also through granting guarantees and subsidising project specific private borrowing. While the former would be treated as deficit spending, the second wouldn't; a change in the form in which the government supports private investment will jeopardize any interpretation of fiscal deficits that included net lending above the line. What is recommended then is to rely simultaneously on two deficit definitions. One is supposed to exclude development lending to the private sector from expenditures, leaving only cashed interest income as genuine revenue. To adjust the Central Bank's income and loss statement to this approach will imply eliminating all non cash (capitalized) interest income, and any write offs or contingent reserves originating in bad loans to the private sector. The second definition will include net lending as deficit spending. To move to this second definition it will suffice to add the difference between new lending and amortization and non-cashed interest income on lending to the private sector.

The treatment of inflation

Whether inflation adjusted or non-adjusted public sector deficits are a better measure of fiscal pressure has been a largely debated issue. The position of this paper is that having both measures will provide more information than any of the two alone and therefore both measures should be attained. The appendix elaborates on the adjustments necessary to adjust Central Banks' results for inflation. In summary the required adjustment me is

$$A = (MB - NCPS)\pi = (MB + DL - CPS)\pi$$

where A = inflationary adjustment

MB = monetary base

NCPS = net credit to the private sector

DL = domestic interest bearing liabilities with the private sector

CPS = domestic interest bearing credit to the private sector

Conceptually, this formula involves two elements; MB.π, which is the accrued inflation tax; and (DL - CPS)π, which is equivalent to the inflationary component of (net) domestic interest payments. Even after accepting that inflation adjustment is meaningful and necessary, a controversy has developed whether inflation adjustment should be limited to correct for the inflationary component of domestic interest or whether it should go one step further to incorporate the (accrued) inflation tax as genuine revenue above the line.

The consequences of considering MB.π as genuine income can be illustrated assuming that: a) the non-financial public sector is in equilibrium; b) the only asset of the central bank is non-interest bearing credit to the government; c) that its only liability is the monetary base and d) that inflation reaches 100% but that the demonetization process keeps the monetary base constant at its original nominal level. Under this set of assumptions, there are no flow results in the Central Bank, since neither assets nor liabilities yield any nominal interest. There are also no changes in assets and liabilities, even when inflation is supposed to be 100%. Application of the previous formula in these circumstances yields a Central Bank surplus equivalent to 100% of the monetary base that has no financial counterpart. We'll be in the presence of a pure capital gain vis a vis the private sector that would be accounted as cashed income. But the "cashed in" inflation tax cannot be larger than the actual nominal increase of the money base (which was assumed to be zero). A similar case exists when nominal interest income or payments are negative in real terms; in this case, the

inflationary component of interest income or payments cannot be more than the actual interest income or payments; using inflation (π) as the adjustment factor would incorporate in the estimation of Central Banks results a capital gain element without a financing counterpart. A deficit measure that is intended to be a financing needs concept should not incorporate items that have no financing counterpart.

At this stage two options are left open; if the correction is limited to the inflationary component of (actual) interest income or payments, the applicable formula is [6]

$$A = (DL - CPS)\pi \qquad \text{for } \pi < i$$

or $$A = (DL - CPS)i \qquad \text{for } \pi > i$$

Alternatively, if the inflation tax were to be treated as genuine revenue, the "cashed in" inflation tax should be incorporated by adding just the actual increase in the monetary base (ΔMB).

The position of this paper is that inflation adjustment should be limited to the inflationary component of (actual) interest income or payments, because fiscal deficits are supposed to explain the government contribution to inflation, among other consequences. Treating the inflation tax as genuine revenue would on the contrary assume inflation away from public sector influence.

6.A subtle, but potentially important issue arises if while the Central Bank's liabilities yield negative interest in real terms, the non-financial public sector domestic debt yields positive interest rates in real terms; in these circumstances if inflation adjustment in Central Bank and government accounts is made independently, the inflation adjustment will be underestimated. Prior consolidation of domestic interest payments seems preferable.

IV. Measuring Central Bank's financing needs

The previous discussion leads to a summary of adjustments required to arrive at a deficit definition of Central Bank's activities compatible with a financing needs concept, starting from an accounting income/loss statement; adjustments should be made as:

a) To eliminate those items related to development lending to the private sector or bad loans absorbed from rescue of financial institutions that may mean either capitalized interest income, write-offs or contingent reserve building. In principle only cashed interest income should remain. However, to obtain a second deficit definition that includes net lending as deficit spending, all new lending should be included as expenditure; and amortization as well as capitalized interest related to previous development lending should be included as income.

b) Eliminate amortization allowances; instead gross investment in fixed assets should be incorporated as an expense.

c) Eliminate any item that represents the impact of revaluation of any asset or liability; or a capital loss vis a vis the private sector originating in exchange guarantees or assumption of liabilities.

d) Correct any improper consolidation of transactions between the Central Bank and the non financial public sector; furthermore any dividend distribution to the Central Government should be included as an expenditure.

e) Correct the foreign exchange intermediation item as to only reflect pure intermediation results.

f) The results obtained must finally be adjusted for inflation as explained in the appendix.

A shortcut of last resort

There are circumstances however in which the described adjustments may not be feasible. A lot of additional information is required but may not be available; it is usual for example to find global accounts that collect results of a very different nature for which disaggregated information is not available or it may be very difficult to prepare.

When that is the case, an alternative option is to estimate the Central Bank's results through changes in foreign and domestic assets and liabilities, using

a) the flow change in foreign assets and liabilities as prepared to produce the balance of payments statistics, converted to the domestic currency. When changes in the exchange rate are important enough, monthly data has to be used to avoid major discrepancies.

b) the nominal increase in net domestic indebtedness as results from comparing the initial and final balance sheet of the Central Bank. Care has to be taken that the increase in credit to the government corresponds to what the government records as financing from the Central Bank. Regarding credit to the private sector, all increases in lending that represent a mere capitalization of interest should be excluded; when it is the case to obtain a deficit definition that includes net lending as deficit spending, any increase in lending to the private sector has to be excluded.

An item by item correction of accounting income and loss statements is preferable, since it allows for an item by item consolidation with non financial public sector deficits which is required for a meaningful analysis of the overall deficit composition. The suggested shortcut is therefore appropriate as a consistency check of above the line estimates or as a final global estimate of the Central Bank's results when above the line corrections are not feasible.

V. Conclusion

This paper has examined the complex issues involved in the analysis of central bank losses. These losses usually originate when the central bank takes on other functions besides its normal role, such as subsidized lending to priority sectors, rescue of troubled financial institutions, or the takeover of private or public debt. However, the losses are difficult to measure because of inconsistencies between central bank and nonfinancial public sector accounting. Issues that cause difficulty include the central bank treatment of nominal capital gains on foreign exchange dealings, accounting of loans, and adjusting operating results for the effect of inflation. We recommend a methodology for dealing with these problems. However, in many cases data problems may force the shortcut of calculating the central bank deficit from the changes in its assets and liabilities.

Appendix

This appendix demonstrates the inflationary adjustments required to be able to consolidate Central Bank's results and non-financial public sector deficits.

The structure of Central Bank's results and liabilities is supposed to respond to the following framework:

Assets		Liabilities	
Foreign assets	FA	Foreign liabilities	FL
Credit to government	CG	Monetary base	MB
Credit to private sector	CPS	Domestic liabilities	DL
Fixed domestic assets	FDA	Net worth	NW
Other assets	OA		

Credit to the private sector comprises all interest yielding, collectible lending. Other assets, on the contrary, comprise all non interest accruing (bad) loans to the private sector and accumulated losses. Domestic liabilities comprise all interest bearing liabilities, most generally remunerated reserve requirements.

Several simplifying assumptions are made; all foreign assets and liabilities are supposed to be denominated in the same foreign currency and yielding the same foreign interest rate ($r^* = r_A^* = r_L^*$). This makes it possible to work with a consolidated net foreign asset position (NFA), where

$$NFA = FA - FL.$$

Credit to the private sector is supposed to yield a market interest rate that is equal to the interest paid by the Central Bank on domestic liabilities; this allows working with a consolidated net credit to the private sector concept (NCPS), where

$$NCPS = CPS - DL$$

Finally, since no financial return is attributable to either fixed assets, other assets or net worth, it is possible to work with a consolidated liquid net worth concept (LNW), where

$$LNW = NW - FDA - OA.$$

The structure of assets and liabilities is therefore be simplified to

Assets		Liabilities	
Net foreign assets	NFA	Monetary base	MB
Credit to the government	CG	Liquid net worth	LNW
Net credit to private sector	NCPS		

In order to model the Central Bank results, two further assumptions are made: first, credit to the government is supposed to bear no interest; this is justified because any assumption regarding this item will be irrelevant if the final objective is to obtain a consolidated fiscal deficit figure. Second, amortization of fixed assets is ignored as the final objective is to obtain a measure of financing needs; gross fixed investment is assumed to be zero.

In a situation of no inflation, the results of the Central Bank (R) will be

$$R = NFA\ r^* + NCPS\ r \tag{1}$$

where r^* = foreign interest rate

r = domestic interest rate

In an inflationary context however, the true nominal profits of the Central Bank (R) can be represented by

$$R = NFA\ (\ d + r^*\ ) + NCPS\ (\ \pi + r\ ) \tag{2}$$

Assuming that the rate of exchange devaluation (d) equals domestic inflation (π)

$$R = NFA\ (\ \pi + r^*\ ) + NCPS\ (\ \pi + r\ ) \tag{3}$$

In order to adjust the true nominal results for inflation (R_{IA}), it has to be assumed that the liquid net worth must grow at least with inflation;[7] therefore

$$R_{IA} = NFA\ (\ \pi + r^*\ ) + NCPS\ (\ \pi + r\ ) - LNW\ \pi \tag{4}$$

Finally, accounting results of the Central Bank (R_A) will be equivalent to

$$R_A = NFA\ r^* + NCPS\ (\ \pi + r\ ) \tag{5}$$

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7. It is implicitly assumed here that the nominal value of fixed assets will grow with the general price level.

Notice that the accounting results, while including the inflationary component on domestic interest (NCPS.π), exclude the devaluation component on foreign assets (NFA.π).

Subtracting (5) from (3) it is possible to obtain the adjustment (A) necessary to move from accounting results to the true nominal results.

$$A = R - R_A = NFA.\pi$$

Similarly, subtracting (5) from (4) it is possible to obtain the adjustment (A) necessary to move from accounting results to true inflation adjusted results.

$$A = R_{IA} - R_A = (NFA - LNW)\pi$$

which can be expressed in the following way

$$A = (MB - CG - NCPS)\ \pi \qquad (6)$$

In order to bring in potential problems of consistency, a stylized set of non financial public sector accounts is also analyzed. Its balance sheet is assumed to respond to the following framework:

Assets		Liabilities	
Fix d assets	$(FDA)_G$	Borrowing from Central Bank	CG
Other assets	$(OA)_G$	Domestic liabilities	$(DL)_G$
Credit to Private Sector	$(CPS)_G$	Foreign liabilities	$(FL)_G$

The borrowing from the Central Bank is equivalent to credit to the government (CG); it is assumed to yield no interest. Domestic liabilities is all interest bearing domestic debt vis a vis the private sector. Credit to the private sector collects the outstanding balance of collectable development lending. Other assets is a balancing item, equivalent to negative net worth.

Assuming that the primary deficit is balanced, the fiscal deficit in a non inflationary situation will be

$$D = FL_G\, r^* + (DL_G - CPS_G)\, r \qquad (1')$$

In an inflationary context, the true nominal deficit is

$$D = FL_G\, (\pi + r^*) + (DL_G - CPS_G)\, (\pi + r) \qquad (3')$$

We can again define the inflation adjusted deficit (IAD) as the total nominal deficit minus whatever adjustment is necessary to keep the real value of the liquid net worth constant

$$IAD = FL\, (\pi + r^*) + (DL_G - CPS_G)\, (\pi + r) - LNW_G\, \pi \qquad (4')$$

However, deficit accounting yields the following result:

$$D_A = FL_G r^* + (DL_G - CPS_G)\, (\pi + r) \qquad (5')$$

Subtracting (5') from (4') we can obtain the adjustment necessary to the accounting measure.

$$A = IAD - D_A = FL_G \pi - LNW_G \pi \qquad (6')$$

In this case, the liquid net worth of the government (LNW_G) is equal to

$$LNW_G = -FDA_G - OA_G = FL_G + CG + DL_G - CPS_G \qquad (5')$$

So (6') can be reformulated as

$$A = IAD - D_A = (DL_G + CG - CPS_G) \pi \qquad (6')$$

Recalling from (6) that the required inflation adjustment to the Central Bank accounts was

$$A = (MB - CG - NCPS) \pi$$

we come to demonstrate that the impact of inflation on credit from the Central Bank to the government ($CG.\pi$) enters in both formulae with opposite sign; therefore we can eliminate this element from both adjustments and work with the remainder elements that collect the net financial position vis a vis the private sector only. For the case of the Central Bank, the required adjustment can be limited to

$$A = (MB - NCPS) \pi$$

provided that the inflation adjustment of the non financial public sector does not include in its base the government debt to the Central Bank.

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